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FLORISTICS OF XERIC SANDHILLS IN NORTHWESTERN LOUISIANA

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ABSTRACT

The floristics and edaphic conditions of three northwestern Louisiana xeric sandhills are described. This community occurs in central and northwestern Louisiana, east Texas, and southern Arkansas. The soil is nutrient poor and porous. Water and air move rapidly through it, causing rapid drying. In presettlement times, xeric sandhills were probably fairly common in northwestern Louisiana, but because of fire suppression, grazing, agriculture, oil exploration, and agroforestry, this community has been almost eradicated and is now considered imperiled.

KEY WORDS: Sandylands, xeric sandhills, floristics, Louisiana

INTRODUCTION

As is the case for so many plant communities of the West Gulf Coastal Plain, there is little published information on xeric sandhills (synonyms: sandylands, oak-farkleberry sandylands, xeric sandy woodlands) (see MacRoberts & MacRoberts 1994 for literature). This community occurs in east Texas, central and northwestern Louisiana, and in southern Arkansas. The xeric sandhills of the West Gulf Coastal Plain appear to be similar to turkey oak sandhill forests in the East Gulf Coastal Plain except for the absence of several key species such as turkey oak (*Quercus laevis* Walt.) and wiregrass (*Aristida stricta* Michx.) and the presence of several western elements not found in the east (Harcombe *et al.* in press; Stout & Marion 1993).

Xeric sandhills occur mainly in Tertiary marine deposits on ridge tops and upper slopes, and on Pleistocene deposits on terraces near streams. The deep sandy soils are of low fertility and, because of their porous nature, water and air move rapidly through them causing rapid drying. Overstory, midstory, and herbaceous vegetation is often sparse allowing sun to reach the ground, and in some areas, trees are virtually absent. Reflected glare from the sand is often intense. Trees, typically a combination of overstory pines and midstory oaks, are often stunted. Lichens and mosses are

usually plentiful on the bare soils, and the soils, where undisturbed, are often cryptogamic.

In order to learn more about this community, we made a study of the vascular flora of three xeric sandhills in Caddo Parish in northwestern Louisiana. In addition we made brief and irregular surveys of other sandhills in Caddo Parish to assess their condition and to look for rare species. Many of these sites are known because of rare species records: others were located through soil maps.

METHODS

We visited three xeric sandhills --- Ida, Kendrick Road, and Roger's Station --- every two to three weeks between the summer of 1994 and the fall of 1995. The three sites are located in T23N R15W Sec. 26, T22N R16W Sec. 11, T21N R16W Sec. 5, respectively, and are within 20 km of each other. The three sites are on private land.

All of the study areas are partly open (10% - 50% cover), the overstory dominated by *Quercus incana* Bartr., *Q. marilandica* Muenchh., *Q. stellata* Wang., and *Pinus taeda* L. Trees are often stunted and small openings occur among the wooded areas. Ida and Roger's Station are each about 1.2 ha. in size while Kendrick Road is only about 0.4 ha. All are about 90 meters above sea level.

The three study sites, although selected because of their relatively good condition, are badly damaged. Roger's Station is an oil field with active wells, pipelines, and storage tanks. It is also the site of earlier sand excavations that left large pits --- some excavated for sand, others as mud pits and for waste water --- now ponds. Ida has some oil/gas pipelines, and storage tanks. It is also the site of earlier sand excavations that left large pits ---some excavated for sand, others as mud pits and for waste water ---- now ponds. Ida has some oil/gas pipelines through it but damage here is mainly the result of agribusiness, roads, herbicides, and fire suppression. Half of Kendrick Road is mowed annually; the remainder is a tangle of shrubs with little or no herbaceous layer. There is little or nothing "natural" about the processes keeping these sites open. Compared with the sites in Natchitoches Parish (MacRoberts & MacRoberts 1994), they are weedy with often a very dense cover of such species as *Cassia, Krigia, Ambrosia, Plantago, Oenothera, Rubus, Gnaphalium, Diodia,* and *Daucus*.

We collected and recorded all vascular plants found. Additionally, we consulted the herbarium at Louisiana State University in Shreveport [LSUS], which has a substantial collection of plants from Ida made by D.T. MacRoberts in the late 1970's (MacRoberts 1979). We follow Kartesz (1994) in most instances of botanical nomenclature. Voucher specimens of many of the species collected are deposited at VDB, LSUS, and LSU.

Soil samples were taken from the upper 15 cm of each sandhill community and analyzed by A&L Laboratories, Memphis, Tennessee.

While the specific fire history of these areas is not known, none has burned in decades. It can be inferred that in presettlement times the sites probably burned regularly since xeric sandhills are continuous with the oak-pine communities surrounding them.

We also made irregular observations of other sandhill sites in Caddo Parish, several of which are known because of the presence of state rare plants. Further sites were located using soil survey maps. We assessed the condition of these areas and looked for rare species. All are badly damaged by various anthropogenic activities.

Annual precipitation averages about 100 cm and is fairly evenly distributed throughout the year. In summer, temperatures rise to 35° C, which, combined with short droughts, translates into very hot and dry conditions. Under these conditions, especially when there are short droughts, the exposed sands become very dry. Drought occurred in August 1995, which may have prevented or delayed flowering in some of the grasses (Edwards *et al.* 1980).

General background information on geology, soils, climate, and plant communities in Caddo Parish can be found in MacRoberts (1979), Edwards *et al.* (1980), and Teague & Wendt (1994).

RESULTS

We list the vascular plants found at Ida (I), Kendrick Road (K), and Roger's Station (R) in Table 1. If the species occurs at all three sites, we give no site location.

We recorded 170 taxa, representing 139 genera and 60 families for the three xeric sandhill sites. Asteraceae, Fabaceae, and Poaceae are the dominant families, accounting for about 36% of the total species. Ida had 143 taxa, Kendrick Road had 118, and Roger's Station had 139. Sorensen's Index of Similarity (IS) shows the three sites to be essentially the same community: Ida/Kendrick Road IS = 76, Ida/Roger's Station IS = 80, and Roger's Station/Kendrick Road IS = 83.

We list the soil characteristics of the three Caddo Parish sandhills in Table 2.

The soil on which this community occurs is acidic loamy fine sand of low fertility and rapid permeability (Edwards *et al.* 1980) and belongs to the same soil series described previously for Natchitoches Parish xeric sandhills (MacRoberts & MacRoberts 1994).

Table 1. Vascular plants at three xeric sandhills in Caddo Parish.

ACANTHACEAE - *Ruellia humilis* Nutt. [K,R].
AGAVACEAE - *Yucca louisianensis* Trel.
AMARANTHACEAE - *Froelichia floridana* (Nutt.) Moq.
ANACARDIACEAE - *Rhus aromatica* Ait., *R. copallina* L., *Toxicodendron radicans* (L.) Kuntze.
ANNONACEAE - *Asimina parviflora* (Michx.) Duval.
APIACEAE - *Daucus pusillus* Michx., *Spermolepis echinata* (DC.) Heller.
AQUIFOLIACEAE - *Ilex decidua* Walt. [K,R], *I. vomitoria* Ait. [I,K].
ASCLEPIADACEAE - *Asclepias amplexicaulis* Sm. [I,R], *A. tuberosa* L. [I,R], *Matelea cynanchoides* (Engelm.) Wood [K,R].
ASTERACEAE - *Ambrosia artemisiifolia* L., *Aster patens* Ait. [R], *Berlandiera pumila* (Michx.) Nutt., *Conyza canadensis* (L.) Cronq. [I,R], *Coreopsis intermedia* Sherff [K,R], *Coreopsis lanceolata* L., *Croptilon divaricatum* (Nutt.) Raf., *Erigeron strigosus* Willd., *Gaillardia aestivalis* (Walt.) Rock., *Gnaphalium obtusifolium* L. [I,R], *Gnaphalium purpureum* L., *Heterotheca pilosa* (Nutt.) Shinners, *Heterotheca subaxillaris* (Lam.) Britt. & Rusby [K,R], *Hieracium gronovii* L. [I], *Hymenopappus artemisiaefolius* DC., *Lactuca canadensis* L., *Liatris elegans* (Walt.) Michx., *Krigia virginica* (L.) Willd., *Rudbeckia hirta* L., *Solidago ludoviciana* (A. Gray) Small, *Tetragonotheca ludoviciana* (Torrey & A. Gray) A. Gray [I,R], *Vernonia texana* (A. Gray) Small [R].
BORAGINACEAE - *Lithospermum caroliniense* (J.F. Gmel.) MacM.
BRASSICACEAE - *Draba brachycarpa* Nutt. *ex* Torrey & A. Gray [I], *Streptanthus hyacinthoides* Hook. [K,R], *Thlaspi arvense* L.
CACTACEAE - *Opuntia humifusa* (Raf.) Raf.
CAMPANULACEAE - *Trifolium perfoliata* (L.) Nieuwl.
CAPRIFOLIACEAE - *Viburnum rufidulum* Raf. [I,R].
CARYOPHYLLACEAE - *Arenaria serpyllifolia* L. [K], *Paronychia drummondii* Torrey & A. Gray [R].
CISTACEAE - *Helianthemum georgianum* Chapm., *Lechea mucronata* Raf.
CLUSIACEAE - *Hypericum gentianoides* (L.) B.S.P., *H. hypericoides* (L.) Crantz.
COMMELINACEAE - *Commelina erecta* L., *Tradescantia reverchonii* Bush.
CONVOLVULACEAE - *Ipomoea pandurata* (L.) Mey. [I], *Stylisma pickeringii* (Torrey *ex* Curtis) A. Gray.
CORNACEAE - *Cornus florida* L.
CUPRESSACEAE - *Juniperus virginiana* L.[I,K].
CYPERACEAE - *Bulbostylis ciliatifolia* (Ell.) Fern. [I,R], *Cyperus retrofractus* (L.) Torrey [I], *C. retroflexus* Buckl., *Rhynchospora grayi* Knunth [I,K], *Scleria triglomerata* Michx. [I].
EBENACEAE - Diospyros virginiana L.
ERICACEAE - *Monotropa uniflora* L. [I], *Vaccinium arboreum* Marsh., *V. stamineum* L. [I,R].
EUPHORBIACEAE - *Cnidosculus stimulosus* (Michx.) Engelm. & A. Gray, *Chamaesyce cordifolia* (Ell.) Small, *Crotonopsis linearis* Michx. [K,R], *Stillingia sylvatica* L., *Tragia urticifolia* Michx. [I,R].

Table 1. (continued).

FABACEAE - *Astragalus leptocarpus* Torrey & A. Gray, *Baptisia nuttalliana* Small [R], *Cassia fasciculata* Michx., *Centrosema virginianum* (L.) Benth., *Crotalaria sagittalis* L. [I], *Dalea villosa* (Nutt.) Sprengel var. *grisea* (Torrey & A. Gray) Barneby [I,K], *Dalea phleoides* (Torrey & A. Gray) Shinners, *Desmodium sessilifolium* (Torrey) Torrey & A. Gray, *Erythrina herbacea* L. [I], *Galactia volubilis* (L.) Britton, *Lespedeza stuevei* Nutt. [I,R], *Pediomelum hypogaeum* (Nutt. *ex* Torrey & A. Gray) Rydb. var. *subulatum* (Bush) J. Grimes [K], *Stylosanthes biflora* (L.) B.S.P., *Tephrosia virginiana* (L.) Pers. [R], *Trifolium arvense* L. [I], *Zornea bracteata* (Walt.) J.F. Gmel.

FAGACEAE - *Quercus falcata* Michx. [I], *Q. incana* Bartr., *Q. marilandica* Muenchh., *Q. stellata* Wang., *Castanea pumila* (L.) P. Mill. [I].

HIPPOCASTANACEAE - *Aesculus pavia* L.

HYDROPHYLLACEAE - *Phacelia strictiflora* (Engelm. & A. Gray) A. Gray [K,R].

GERANIACEAE - *Geranium carolinianum* L.

JUGLANDACEAE - *Carya tomentosa* (Poir.) Nutt., *Juglans nigra* L. [R].

JUNCACEAE - *Juncus marginatus* Rostk. [K,R].

LAMIACEAE - *Hedeoma hispidum* Pursh, *Monarda punctata* L., *Salvia azurea* Michx. & Lam. [I], *Scutellaria cardiophylla* Engelm. & A. Gray, *Teucrium canadense* L. [I], *Trichostema dichotomum* L. [K,R].

LAURACEAE - *Sassafras albidum* (Nutt.) Nees.

LILIACEAE - *Smilax glauca* Walt., *S. smallii* Morong.

LOGANIACEAE - *Gelsemium sempervirens* (L.) St. Hil. [I,R].

NYCTAGINACEAE - *Mirabilis albida* (Walt.) Heimerl.

OLEACEAE - *Chionanthus virginicus* L.

ONAGRACEAE - *Gaura sinuata* Ser. [I,R], *Oenothera biennis* L. [I,R], *O. laciniata* Hill.

OXALIDACEAE - Oxalis stricta L. [I,R].

PINACEAE - *Pinus echinata* P. Mill., *P. taeda* L.

PLANTAGINACEAE - *Plantago aristata* Michx., *P. hookeriana* Fisch. & Mey., *P. virginica* L. [I,R].

POACEAE - *Aristida desmantha* Trin. & Rupr. [K,R], *A. lanosa* Ell., *A. oligantha* Michx., *A. purpurascens* Poir. [I,R], *Cenchrus incertus* M.A. Curtis, *Dichanthelium oligosanthes* (Schult.) Gould, *D. villosissimum* (Nash) Freckman [I], *Eragrostis hirsuta* (Michx.) Nees [I,R], *Eragrostis secundiflora* Presl. [I], *Eragrostis spectabilis* (Pursh) Steud. [R], *Eragrostis trichodes* (Nutt.) Wood [R], *Erianthus alopecuroides* (L.) Ell. [I], *Gymnopogon ambiguus* (Michx.) B.S.P., *Leptoloma cognatum* (Schult.) Chase, *Paspalum setaceum* Michx., *Schizachyrium scoparium* (Michx.) Nash [I,R], *Sorghastrum elliottii* (Mohr) Nash [I], *Sphenopholis obtusata* (Michx.) Scribn. [I,K], *Tridens flavus* (L.) Hitchcock, *Triplasis purpurea* (Walt.) Chapm., *Vulpia octoflora* (Walt.) Rydb., *V. sciurea* (Nutt.) Henr.

POLYGALACEAE - *Polygala polygama* Walt.. [R].

POLYGONACEAE - *Eriogonum longifolium* Nutt., *Polygonella americana* (Fisch. & Mey.) Small [I], *Rumex hastatulus* Ell.

RANUNCULACEAE - *Anemone caroliniana* Walt. [K], *Clematis reticulata* Walt., *Delphinium carolinianum* Walt. [K,R].

Table 1. (continued).

RHAMNACEAE - *Ceanothus americanus* L. [I].
ROSACEAE - *Crataegus uniflora* Muenchh. [K], *Potentilla recta* L. [I], *Prunus angustifolia* Marsh. [I], *Prunus caroliniana* (P. Mill) Ait. [I], *Prunus gracilis* Engelm. & A. Gray, *Prunus umbellata* Ell. [K,R].
RUBIACEAE - *Diodia teres* Walt.
RUTACEAE - *Zanthoxylum clava-herculis* L. [I,K].
SAPOTACEAE - *Bumelia lanuginosa* (Michx.) Pers.
SCROPHULARIACEAE - *Linaria canadensis* (L.) Dum.-Cours., *Penstemon australis* subsp. *laxiflorus* (Pennell) Bennett [K], *P. murrayanus* Hook. [I].
SELAGINELLACEAE - *Selaginella arenicola* Underw. subsp. *riddellii* (Van Eselt.) Tryon [R].
SOLANACEAE - *Physalis heterophylla* Nees., *P. mollis* Nutt. [I,R].
ULMACEAE - *Ulmus alata* Michx.
URTICACEAE - *Parietaria pensylvanica* Muhl. *ex* Willd. [I].
VALERIANACEAE - *Valerianella radiata* (L.) Dufr. [K,R].
VERBENACEAE - *Glandularia canadensis* (L.) Nutt., *Verbena halei* Small [I,R].
VIOLACEAE - *Viola rafinesquii* Greene, *V. villosa* Walt. [I,K].
VITACEAE - *Ampelopsis arborea* (L.) Koehne, *Vitis aestivalis* Michx., *V. rotundifolia* Michx.

Table 2. Soil characteristics of three xeric sandhills in Caddo Parish.

		Exchangeable Ions (ppm)				
Sample	pH	P	K	Ca	Mg	Organic Matter %
Roger Station	5.7	25	50	170	25	1.7
Kendrick	5.6	12	36	270	37	2.3
Ida	5.9	14	34	260	26	1.9

DISCUSSION

Floristically, these three xeric sandhills are essentially the same as xeric sandhills farther south in Natchitoches Parish (MacRoberts & MacRoberts 1994). Since the sample sizes are different, Sorensen's Index of Similarity has not been calculated, but 82% of the species found in one Natchitoches Parish site also occur in the Caddo sandhills.

As mentioned above, in addition to surveying these three sites, we made brief surveys of locations where rare sandhill species had been previously found (Louisiana Natural Heritage files) or which showed up as being on similar soil types to the three study areas (Betis-Briley-Darden, Sacul-Ruston) (Edwards *et al.* 1980).

We found only one other site in the dozens surveyed to be comparable in quality to the three study sites. This site is an oil field with trash piles, pipe lines, well roads, and is badly fire suppressed. We first visited this site in the late 1970's and it has deteriorated substantially. It is briefly described by Teague & Wendt (1994), who consider it to be the highest quality site in the area, a conclusion with which we do not demur, except to emphasize that it is badly degraded.

Most of the other Caddo sandhills are either totally altered from original conditions (*e.g.*, are now pastures, fields, mobile home sites, cemeteries, and churches) or are so badly degraded (*e.g.*, are pine plantation with only a few sandhill species hugging the road edges) as to be basically unrecognizable as once having been xeric sandhills.

These surveys allowed us to compare sandhill communities in central Louisiana and in east Texas (MacRoberts & MacRoberts 1994). Our finding is that none of the Caddo Parish sites is of comparable quality to the best sites in the Kisatchie National Forest or in east Texas (see references in MacRoberts & MacRoberts 1994).

We are chary of estimating total area of this community remaining in Caddo Parish since we did not set out to determine this, but assuming that much of the sandy soils were once xeric sandhills, there is very little left. Today, this community is scattered in small, badly degraded, patches. None is high-quality. While there may be a lot of Betis/Briley/Darden and Sacul/Ruston soils in Caddo Parish, soil occurrence does not translate into a functional plant community. Consequently, we agree with Teague & Wendt (1994) and with the Louisiana Natural Heritage Program in designating this community imperiled in Louisiana.

How much of this community existed in Caddo Parish in presettlement times can only be conjectured, but it probably measured in the thousands of acres. The very little that is left is mostly due to the inadvertent creation of artificial refugia on road sides, and in oil fields and derelict hay fields.

Since xeric sandhills are usually found in badly disturbed areas, it has been assumed that they are "disturbance" communities. This conclusion is a natural one considering the appalling conditions in which sandhill species "hang on," and is probably true to the extent that sandhills surely require repeated but occasional fire for full development. Nevertheless, ground disturbance associated with logging, road construction, and oil field work will eventually destroy these communities. Sandhill species are often found in highly disturbed sandy areas because they require an open habitat and can tolerate some anthropogenic disturbance at least for awhile, but the original structure of both the community and the soil is obliterated under these conditions.

While seldom evident except under fairly intact conditions, sandhill soils are cryptogamous. In open areas among the scattered plants there is a substantial cover of mature cryptogamic crusts. Ground disturbances destroy this layer, leading in turn to rapid erosion, loss of soil nutrients, and rapid water evaporation (Hogan 1994). Also, under intact conditions the surface may have extensive patches of *Cladonia* moss. Neither cryptogamic crusts nor *Cladonia* are frequently encountered in Caddo Parish sandhills.

We believe that xeric sandhills in Caddo Parish have been degraded so badly that little remains of this community. Restoration efforts might simulate or counterfeit what this community might have been in presettlement times, but whether or not such efforts could actually bring the community back is not known.

In the course of this work we kept records of rare sandhill species (Louisiana Natural Heritage Program 1995) that occur in Caddo Parish. These are: *Astragalus soxmaniorum* Lundell, *Coreopsis intermedia* Sherff, *Crataegus uniflora* Muenchh., *Croton argyranthemus* Michx., *Dalea phleoides* (Torrey & A. Gray) Shinners, *Dalea villosa* (Nutt.) Sprengel var. *grisea* (Torrey & A. Gray) Barneby, *Eriogonum longifolium* Nutt., *E. multiflorum* Benth., *Matelea cynanchoides* (Engelm.) Woods., *Mirabilis albida* (Walt.) Heimerl., *Paronychia drummondii* Torrey & A. Gray, *Pediomelum digitatum* (Nutt. *ex* Torrey & A. Gray) Isely, *Pediomelum hypogaeum* (Nutt. *ex* Torrey & A. Gray) Rydb., *Penstemon murrayanus* Hook., *Phacelia strictiflora* (Engelm. & A. Gray) A. Gray, *Polygonella americana* (Fisch. & Meyer) Small, *Prunus gracilis* Engelm. & A. Gray, *Quercus arkansana* Sarg., *Scutellaria cardiophylla* Engelm. & A. Gray, *Selaginella arenicola* Underw. subsp. *riddellii* (Van Eselt.) Tryon, *Streptanthus hyacinthoides* Hook., *Talinum parviflorum* Nutt. *ex* Torrey & A. Gray, *Tetragonotheca ludoviciana* (Torrey & A. Gray) A. Gray, *Thelesperma filifolium* (Hook.) A. Gray, *Tradescantia reverchonii* Bush, *Zornea bracteata* (Walt.) Gmel. Only a few of these did not occur in one or more of the three study sites.

POSTSCRIPT

On our last round of visits to the study sites on November 16, 1995, Kendrick Road was destroyed and a house was being constructed on the site.

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